

**ABSTRACT**

Cellulose synthase ("CS"), a key enzyme in the biosynthesis of cellulose in plants is inhibited by herbicides comprising thiazolidinones such as 5-tert-butyl-carbamoyloxy-3-(3-trifluoromethyl) phenyl-4-thiazolidinone (TZ), isoxaben and 2,6-dichlorobenzonitrile (DCB). Two mutant genes encoding isoxaben and TZ-resistant cellulose synthase have been isolated from isoxaben and TZ-resistant *Arabidopsis thaliana* mutants. When compared with the gene coding for isoxaben or TZ-sensitive cellulose synthase, one of the resistant CS genes contains a point mutation, wherein glycine residue 998 is replaced by an aspartic acid. The other resistant mutation is due to a threonine to isoleucine change at amino acid residue 942. The mutant CS gene can be used to impart herbicide resistance to a plant; thereby permitting the utilization of the herbicide as a single application at a concentration which ensures the complete or substantially complete killing of weeds, while leaving the transgenic crop plant essentially undamaged.